STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

Illinois Commerce Commission	)	
On Its Own Motion	)	
	)	20-NOI-03
Notice of Inquiry Regarding Rate	)	
Design and Affordability with	)	
respect to Transportation	)	
Electrification and Other	)	
Beneficial Electrification	)	

RESPONSE TO NOTICE OF INQUIRY

The Citizens Utility Board ("CUB") and Environmental Defense Fund ("EDF") provide these initial comments to the Illinois Commerce Commission's ("ICC" or "Commission") Notice of Inquiry ("NOI") to examine rate design issues applicable to Transportation Electrification ("TE"), including information on the impact of electricity rate design on TE and TE infrastructure adoption and information on what specific rate designs should potentially be adopted in Illinois to ensure that electricity rates do not impose barriers to TE and TE infrastructure adoption and deployment.

The electrification of transportation presents a rare opportunity to achieve gains for all stakeholders affected by electricity regulatory policy. The right set of policies can help achieve the traditional regulatory goals—safe, reliable, and affordable service—while also advancing goals of sustainability, efficiency, and customer choice. While regulators don't typically focus on end-use electricity— after all, there aren't regulatory proceedings about refrigerators or coffee-makers — electric vehicles ("EVs") are different from other appliances in ways that have profound implications for the electricity system. An EV in the garage could increase the electricity consumption of an average household by 40%—and millions of them could require costly expansion of electric system delivery and generation capacity if that energy is not effectively managed. Moreover, the transportation sector in aggregate, currently a small user of all electric service, is poised to become one of the largest drivers of total electric consumption in a decarbonized future. But if EVs and EV infrastructure are managed as distributed energy resources ("DERs"), the rise of transportation electrification can lead to lower—not higher—electric rates and bills for all consumers.

CUB has published three guides on the regulatory and policy issues surrounding electric vehicles ("EVs"): *The ABCs of EVs: A Guide for Policy and Consumer Advocates* (2017)[1], *Charging Ahead: Deriving Value from Electric Vehicles for All Electricity Customers (*2019)[2] and the recently published *EV For All: Electrifying Transportation In Low-Income Communities*

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[1] https://citizensutilityboard.org/wp-content/uploads/2017/04/2017_The-ABCs-of-EVs-Report.pdf
[2] https://www.citizensutilityboard.org/wp-content/uploads/2019/03/Charging-Ahead-Deriving-Value-from-Electric-Vehicles-for-All-Electricity-Customers-v6-031419.pdf

(2020).[3] EDF, likewise, has published several reports and policy documents concerning the electrification of transportation (especially the medium/heavy-duty vehicle sector),[4] including a recent policy paper focused specifically on electric rate design.[5] Both CUB and EDF draw on the research, sources, and policy expertise supporting those papers in many of the following comments and encourage the Commission to reference those guides for additional data and background.

CUB and EDF applaud the Commission's leadership in pursuing a broad range of perspectives and policy positions with regard to the critically important nexus between decarbonization and beneficial electrification. Transportation electrification ("TE") has a unique capability to capture the potential of EV growth to contribute to system optimization. Proactive regulatory efforts to set the direction of state policies are crucial at this nascent stage of EV market development.

The concern regarding the inexorable march of unchecked climate change is now joined by the economic and health crises caused by the pandemic, along with the burgeoning movement to fight systemic racism which must be considered holistically to achieve effective, equitable and robust solutions. Overburdened and underserved communities are disproportionately vulnerable to these health and environmental threats, making environmental justice an urgent concern for the post-pandemic world. Climate change is now a top public issue, with 67% of likely voters ranking it as either a "crisis" or a "significant concern" in a 2020 national survey. A similarly high percentage of voters were concerned about energy affordability. Transportation electrification can address both of those concerns with sound public policies. Not only does it reduce local air pollution and global climate change, it also can lower electric bills for consumers. Good regulatory policy, including creating and adapting rate mechanisms to incentivize and encourage distributed generation ("DG"), EV and TE growth, can successfully mitigate the challenges of high bills and pollution that negatively impacts health and the climate.

The following core principles should guide public policy discussions on EV and TE:

1. **Optimize charging patterns to improve system load shape, reduce local load constraints, and maximize utilization of renewable generation;**

   Using a combination of time-based rates, smart charging, financial incentives and other innovative applications, potentially including geographically-specific payments for grid services, EV loads should be managed in the interest of all electricity customers.

[3] https://www.citizensutilityboard.org/wp-content/uploads/2020/06/EV-for-All.pdf
[4] https://theicct.org/publications/canada-race-to-zero-oct2020 (published jointly by the International Council on Clean Transportation, Propulsion Québec, and EDF); https://www.edf.org/sites/default/files/documents/TransportationWhitePaper.pdf
[5] http://blogs.edf.org/energyexchange/files/2020/10/ChargingFactSheet.pdf

2. **Ensure any utility customer-funded programs provide demonstrable system benefits;**

   Cost-benefit analytical frameworks should be developed to project the effects of proposed EV policies and to evaluate ongoing performance of implemented programs. Customer funding of charging infrastructure should include smart dispatch requirements, mechanisms and policies. These can iterate over time as new options become available, but should be part of initial plans.

3. **Allow EV chargers to be grid-connected efficiently, quickly, and safely;**

   Administrative process should be minimized and permitting should be expedited so that customers and service providers face minimal impediments and delays.

4. **Facilitate aggregation of EV demand for dispatch as a DER;**

   The opportunity to participate in Demand Response programs should be made available to all EV chargers, and public policy should make it as seamless as possible to participate.

5. **Benefit underserved/disadvantaged communities;**

   A portfolio of EV programs and policies should be designed to benefit all geo-demographic customer segments in a service territory. Efforts to bring EVs to low-income areas could include subsidized EV car-sharing services or EV transit, rather than installation of charging stations in neighborhoods where EVs may be unaffordable or impractical for residents to own.

6. **Promote interoperability, common standards and open networks;**

   Any utility investments and subsidies should support deployment of technologies that accommodate all EV makes and models, allow seamless flows of data, and accommodate all EV drivers. Utilities can play an important coordinating role in promoting interoperable, open networks.

7. **Support competition to accelerate market development, encourage private investment, promote innovation and bring down prices;**

   Competitors should not be restricted from entering markets for EV-related goods and services. Investments paid for by utility customers require regulatory oversight to protect consumers.

8. **Deploy utility resources where needed to address public needs;**

   Utility investments should complement private investment, which, at current levels, will not provide adequate support for widespread vehicle electrification.

This will better ensure maximum public benefits and rapid transformation.. Putting grid optimization at the center of EV planning is key to reaching this objective.

9. **Foster coordinated regional planning for systems and infrastructure to accommodate and integrate expanding EV loads;**

   EV demand is part of complex system dynamics, with potential efficiencies from multi-utility and multi-state coordination.

10. **Manage EV loads to reduce energy costs.**

    Increased energy sales to fuel EVs allow utility fixed costs to be spread over a larger number of kilowatt-hours, benefiting all customers when policies and programs are designed to make sure incremental revenue from EV loads exceeds the incremental cost to serve it. Managing EV charging can change load shapes, leading to reductions in peak demand, cost savings from avoided capacity costs, and avoided curtailment of renewables where there might otherwise be oversupply at certain times.

Each of these points should be considered in developing a strategic holistic plan for regulators and policy makers to deliver the maximum benefits to consumers while optimizing grid and clean energy resources.

A. Rate Design Impacts on Electric Vehicle Adoption and Use

1. EV Adoption and Use by Residential Customers Living in Single-Family Housing

a. Do current electric rate designs prevent residential customers living in single-family housing from adopting and using EVs? If so, how?

Customer choice is generally preferable to regulatory mandates, but incentives for participation by EV owners in programs benefiting all customers might include both carrots and sticks. Optimizing grid value will require policies that impact load shape. The generation mix and the shape of demand are key factors in designing EV policies. While many systems reach peak annual demand on hot summer days, others may see maximum usage on cold winter nights. Some systems are dominated by commercial/industrial demand and others by residential usage. In all cases, managed EV charging can help fill the gaps and flatten the load shape to make the system more efficient, complementing other demand management programs.

Advanced Metering Infrastructure (“AMI”), smart meters, now installed at more than half of U.S. homes and ubiquitously in the Ameren and ComEd service territories, captures near real-time data on energy consumption, demand, voltage and other end-use characteristics and allows two-way communication with the utility through a digital network. This technology is critical to enabling time-of-use (“TOU”) and other dynamic rate structures that can be used to incentivize residential EV use, flatten load, and enhance grid reliability. A weak link in the chain of innovative rate options is the limitations of legacy utility software and billing systems. Many jurisdictions are looking at what upgrades would be needed to implement the sophisticated rate structures that AMI makes possible and utilities continue to move toward cloud-based solutions to accommodate other types of advanced technology in utility operations.

The structure of electricity rates has a big effect on how much of it is consumed and when consumption occurs. Raising the cost of a kWh will cause people to use less of it. Raising prices at certain times and lowering them at other times will move some usage from the higher-priced to the lower-priced periods. The amount by which consumers will use less when the price goes up—the elasticity of demand—is relatively low for an essential commodity like electricity, which has some usage that can't be controlled. We can't turn the refrigerator off, no matter the price. But some of us would do the laundry on nights or weekends if the price were discounted at those times, and would turn up the temperature on the AC unit during high-priced periods, especially if it were done automatically.

There are at least as many rate designs as there are utilities, but all are intended to provide opportunity for recovery of an amount of annual revenue determined by regulators to be sufficient for long-term reliable service (including an adequate return on investment), while fairly spreading the costs of the distribution system among customers. In rate design theory, fairness is closely aligned with the aim of "assigning costs to cost causers," a principle subject to the overarching public interest standard that utility rates must be "just and reasonable." Ratemaking has always been subject to an array of social goals, including economic development, universal service, support for renewables, load building, load shedding, and load shaping. These sometimes conflicting objectives often make rate design proceedings adversarial, as the allocation of the revenue requirement appears at the outset to be a zero-sum game: when somebody's bills go down, somebody else's must go up. While allocation of costs may be a zero-sum game, rate design can have a big effect on overall utility cost levels as well as economic, social and environmental impacts. Better pricing of the energy commodity could lower everyone's bills at once through load shaping and largely avoiding use of higher-cost resources.

No matter how and where you set them, rates send signals as to how electric service is to be valued, which influence the behavior of all actors in the chain of supply and demand, including electricity users, producers, distributors and markets. An optimal rate design can achieve a number of desirable objectives with little to no downsides: making EVs more economical, making the system more efficient, improving reliability, curtailing emissions and reducing average unit costs of electricity—while better aligning the interests of the utility and its customers. But the right rate design can be quite different from place to place because it must take into account a long list of variables including market structure, load characteristics, meter technology, generation mix, economic drivers, distributed resources, climate factors and social goals.

A restructured state like Illinois, with smart meters in place, has a different set of rate options from its vertically integrated neighbors in Indiana and Wisconsin. Rate design is a way to allocate a known or projected amount of costs among customers, not a determinant of the revenue or earnings of a utility, though this policy view is not necessarily shared by many utilities that continue to advocate for revenue stability rate mechanisms. Elements of typical traditional rate designs and their implications for EV charging include: Fixed Monthly Basic

Customer Charge; Fixed Monthly Distribution Charge; Volumetric Distribution Charge; Inclining Block Charges (aka Inverted Block Rates) that step up the unit cost of usage charges by block.

Optimizing EV charging patterns requires sending price signals to customers indicating when—from the point of view of the electricity system—are the best times to charge vehicles, as well as how rapidly to charge them. Measuring when usage occurs in addition to how many kWh of electricity are used in a month entails meters that record and retain usage data in each hour or smart meters that communicate consumption levels and other data to the utility in near-real time. Time-based rate options include:

- **Time-of-Use ("TOU") rates**: By charging higher prices in peak periods and lower prices off-peak, rates influence customer usage patterns. In a TOU rate, both the definition of peak and off-peak, and the prices during those periods, are set *a priori*. The efficacy of a TOU rate structure depends on the declining block rates, under which prices decrease with higher usage. These are still employed in some jurisdictions to support large industrial facilities but have largely disappeared from smaller customer rate design. pattern and magnitude of its price variation. A market-based rate schedule that approximates differentials between average wholesale prices at different times is not as effective at influencing usage patterns as rates with larger and more uniform price variations. TOU rates can be calculated using a predetermined Peak to Off-Peak Price (POPP) ratio. For example, off-peak, shoulder peak, and peak rates could be set at easily understood ratios such as 1-2-4 or 1-3-6.

- **Renewable Output Rates**: Variable output of renewable generation can have a dramatic effect on the resource mix, and price signals can optimize use of this zero-incremental cost energy. For example, electric rates could be reduced during peak periods of wind or solar output, and/or EV charging could be managed to coincide with it. However, the difference in impact on local wires systems between distributed rooftop solar and central station solar generators complicates these considerations and requires smart charging technology.

- **Real-Time Pricing ("RTP")**: In restructured states, where rates for commodity energy are unbundled from delivery services, RTP programs can tie retail energy rates directly to wholesale market price, changing each hour. To date, the only state that offers optional residential RTP is Illinois. While it exposes customers to potential – yet infrequent – price spikes, experience over eight years in Illinois has shown so far that most customers would see lower bills under RTP. Because off-peak competitive energy prices often are very low—occasionally dropping to zero or below in some wholesale markets—RTP can substantially reduce EV charging costs, particularly when combined with TOU distribution rates and price-responsive smart charging equipment.

- **Demand Based Rates ("DBR")**: Demand-Based Rates collect a portion of delivery costs according to how much electricity is used by a customer at one time, rather than by monthly energy volume or in fixed monthly fees. Generally, DBR reward

> customers with flatter load shapes at the expense of customers with steep peaks and valleys of usage. Demand rates are a common component of commercial and industrial rates and more than 15 utilities offer some form of optional DBR to residential customers. Their effect on EV costs depends on how the demand charge is calculated. For example, if a demand-based rate uses a simple "ratchet" based on maximum usage in any hour of the month, an EV owner could see high demand charges, (called "noncoincident peak"), particularly if they charged the car while using other appliances and lighting, regardless of what grid conditions exist at that time. However, if a DBR is calculated exclusively or primarily on demand during peak periods, (called "coincident peak"), such as daytime afternoons, a more powerful signal would be sent to charge EVs at night or on weekends, as off-peak charging would incur no demand charges.
>
> High demand charges present a big challenge to cost recovery for the "peaky" load shapes of public fast-charge stations, which may require special rate designs to be commercially viable.

One rate structure is usually applied to all usage on a customer's meter. However, a different set of rates can be used for EV charging through a separate meter or a sensor attached to the EVSE. Disaggregation software with the capability of dividing a household's overall electricity usage into its end use components can also allow vehicle charging costs to be calculated under distinct rates. Separately calculating EV charging costs can be a boon to adoption by customers who fear having all their household usage priced under TOU rates. But it raises the question of whether such a carve-out is appropriate. Under a pilot program of utility PEPCO in Maryland, EV owners could choose to have their EV usage metered and charged separately or to have whole-house TOU rates. Most chose separate EV rates, and in both cases TOU rates had a significant effect on charging behavior. EVs offer the perfect type of load shape for time-variant pricing (whether real-time pricing or time of use rates), so that kind of rate design should be utilized. Time-based rate options are clearly effective at motivating EV owners to charge their vehicles when they will not burden the utility system. But to further capture the system benefits of EVs' load flexibility requires an additional technology: smart charging. High neighborhood concentrations of Level 2 chargers could change system dynamics and increase capacity needs, particularly if many vehicles are charging simultaneously; managing that load is critical.

b. Should electric rate designs be used to encourage residential customers living in single-family housing to adopt and use EVs? Why or why not?

Yes. Optimized charging not only reduces the EV owner's electricity costs, but also makes the system load shape more efficient, enhances reliability of the grid, and reduces pollution by maximizing use of clean energy. The more EVs are added to the nation's roadways, the more electricity consumers—all of us—will see lower electric rates. In *Charging Ahead: Deriving Value from EVs for All Electricity Customers (2019)*, CUB analyzed different EV market penetration scenarios and found that the combined projected value to Illinois electricity customers of optimized charging patterns ranged from $469 million to $2.6 billion. In that guide, CUB detailed policies designed to achieve the best outcome for all electricity consumers, whether or not they drive an EV, including:

- EV-only time-of-use (TOU) rates to home chargers with:
    - Significant time price differential;
    - No separate meter required;
    - No extra monthly fees beyond the cost of service;
    - Separate listing of EV usage on each monthly electric bill.

- Direct charging control programs on congested circuits to respond to local system conditions and do the following:
    - Manage critical peak periods;
    - Aggregate EV load as a Demand Response resource;
    - Maximize renewable energy utilization.

- Support for public charging, including alternative rate designs to encourage deployment.

- Online EV tools and apps to:
    - Automate response of chargers to signals such as price, emissions and real-time renewable generation output;
    - Provide shadow bills so customers can compare current and historical monthly costs under different rate plans;
    - Include cost calculators to do cost comparisons between EV and internal combustion ("IC") vehicles, given inputs such as miles driven, purchase price, financing, gasoline cost, electricity rate plans, and other variables.

- Outreach and education by utilities, independent groups, and regulators.

- Programs designed to ensure all customer segments benefit from EV growth, including low and moderate-income customers and communities of color that are disproportionately impacted by transportation air pollution.

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate residential customers living in single-family housing to adopt and use EVs?

EVs offer the perfect type of load shape for time-variant pricing, whether real time rates or time of use rates. Time-based rate options are clearly effective at motivating EV owners to charge their vehicles when they will not burden the utility system.

d. How do electric rate designs used to encourage single-family residential customers to adopt and use EVs affect the affordability of electric service for other electricity users?

2. EV Adoption and Use by Residential Customers Living in Multi-Family Housing

a. **Do current electric rate designs prevent residential customers living in multi-family housing from adopting and using EVs? If so, how?**
b. **Should electric rate designs be used to encourage residential customers living in multi-family housing to adopt and use EVs? Why or why not?**
c. **If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate residential customers living in multi-family housing to adopt and use EVs?**

The key challenge in setting rates for charging at multi-family housing is ensuring that the incentives arising from the utility's rate structure actually reach the end-user, i.e. the individual charging the EV. Often, in rental housing, owners of multi-unit dwellings don't have the same impetus to manage energy usage as tenants, and so don't choose to pass through a time variant price signal to their customers. As a result, residents of multi-family housing (if they are able to have building access to a charging station at all) may be hesitant to purchase an EV, as they don't necessarily have an opportunity to see fuel cost savings even if they charge at favorable times when electric service should be inexpensive. Although the split incentive is a longstanding barrier to sound management of residential energy consumption in the multi-family context, the Commission should ensure that EV owners plugging in their vehicles at multi-unit dwellings experience a price signal that allows them to proactively manage their charging in a way that saves them money and that allows them to charge in a grid-friendly way. A good model to follow is the recent decision in Southern California Edison's Charge Ready 2 program – in which the California Public Utilities Commission states "establishing a default arrangement that site hosts pass through TOU price signals to drivers would promote charging in a manner that is consistent with grid conditions, offer the opportunity for drivers to realize fuel cost savings, and preserve flexibility to accommodate site host operational needs."[6]

d. **How do electric rate designs used to encourage multi-family residential customers to adopt and use EVs affect the affordability of electric service for other electricity users?**

3. **EV Charging by Employees at the Workplace**
    a. **Do current electric rate designs prevent businesses from installing EV charging infrastructure for their employees or employees from charging EVs at their workplaces? If so, how?**
    b. **Should electric rate designs be used to encourage businesses to install charging infrastructure and for employees to charge EVs at their workplaces? Why or why not?**
    c. **If you are in favor of providing incentives through rate design, what specific electric rate designs can be used to motivate businesses to install charging infrastructure and for employees to charge EVs at their workplaces?**
    d. **How do electric rate designs used to incent businesses to install charging infrastructure and for employees to charge EVs at their workplaces affect the affordability of electric service for other electricity users.**

[6] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M345/K702/345702701.PDF

The Commission should focus on ensuring that businesses deploy charging infrastructure at workplaces that incentivizes charging during the middle of the day, when demand overall is likely to be lower and renewables are more likely to be prevalent. Put another way, enhancing charging of vehicles at work will be important to deriving benefits for the grid and the environment. As well, it will be critical to consider the needs of commercial businesses thinking about a transition to electric vehicles.

e. **Provide examples of rate designs employed in other states or jurisdictions that successfully incentivized business to install charging infrastructure for employees and/or customers.**

4. **EV Fleet Adoption and Use by Businesses**

a. **Do current electric rate designs prevent business customers from adopting and using EV fleets? If so, how?**

It depends on the particular rate design and the particular customer type – estimates of the number of commercial fleet subtypes range as high as 85 – but potentially, yes. Utilities need to work with the Commission to understand the needs of commercial fleets and other commercial customers. Appreciating the implications of these business needs for deployment of charging stations and their impact on the grid will be imperative to successfully integrating increasing numbers of commercial electric vehicles.

Demand-based rates that are based primarily on the customer's high demand whenever it occurs (that is, non-coincident demand-based rates) can, particularly for low load factor customers, result in charging costs that are unacceptably high compared to diesel. Additionally, depending on the operational needs of a particular fleet, customers may believe they have little ability to manage their demand in a manner that avoids these high charges. This does not necessarily mean that demand-based rates cannot be adapted for prospective fleet customers, but it does mean that design flaws in some existing demand-based rate structures that may make them needlessly discouraging for newly electrifying fleet customers should be addressed, and that the chilling effect that demand-based rates can have on fleet owners who believe that they will not be able to manage their energy usage needs to be taken into account to avoid allowing perceptions associated with these rates to slow down EV adoption.

Commercial demand-based rates may needlessly chill EV adoption where they provide a price signal that is inherently inefficient (for all customer types, not only EV charging customers), as well as harder than necessary for customers to respond to. For example, this is typically true of non-coincident demand-based rates, which are common in some states; while charges based primarily on coincident peak demand, especially in the long-term, can be beneficial in alleviating burdens on the grid, charging customers primarily based on their non-coincident peak demand has no such benefit. Indeed, commercial rates that fail to distinguish between coincident and non-coincident peak demand may discourage energy usage even when there is *excess* renewable generation, resulting in expensive curtailment and thus waste of renewable energy resources. A discussion of options for adapting rates to meet the needs of new electrification customers can be found further below, in response to question 13(a).

b. **Should electric rate designs be used to encourage business customers to adopt and use EV fleets? Why or why not?**

Over the long term, it is essential that fleet charging, which will ultimately become a major source of electric load, be shaped by prices that incentivize customers to manage their demand. However, early on, while fleets have only partially electrified but may already have invested in charging infrastructure, infrastructure may be underutilized, leading to low load factors. This has the potential to make conventional demand charges challenging for some fleet customers to manage during the early phase of their fleet electrification. To address this temporary barrier to fleet electrification, the Commission should ensure that EV customers have access to rates that have a time-variant volumetric component as well as a temporary mechanism for providing demand charge mitigation for customers who need that to get through the early phase of the transition. All of the investor-owned utilities in California have recognized this issue. Instituting a "demand charge holiday" or substituting a demand charge with a subscription charge (structured like a cell phone plan, in which the customer approximates the amount of demand needed on their "plan" and must pay overages for going above that allotment) might be viable short-term means of alleviating the risk that demand charges could have a chilling effect early on. Other options for mitigating any chilling effect that demand charges could have on fleets include assessing demand over a comparatively long period, or re-assessing demand frequently (for example, daily). Additionally, to the extent that fleets' difficulties with traditional demand-based rates may arise from their inexperience with such rates and/or with the new complexities of charging an electrified fleet, education, outreach, and enabling technologies may help them bridge the gap and achieve optimal cost and environmental outcomes for their own fleet and for the grid as a whole.

In addition, time-variant pricing for the energy commodity that reflects actual grid conditions (such as the RTP tariffs already in place in Illinois) can help ensure that customers have an opportunity to manage their energy consumption in a manner that is financially beneficial to themselves as well as to the grid, and enhance customers' opportunity to achieve cost savings relative to diesel.

a. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate business customers to adopt and use EV fleets?

EDF/CUB do not advocate embedding in rates incentives directly relating to EV adoption (e.g. a flat discount on electricity bills as a result of EV adoption) as this both fails to reflect the cost of serving a customer and also fails to provide customers with an efficient incentive to manage their charging in the manner that is most beneficial to the system. However, rates should be designed in a way that, if customers are able to manage their energy usage to avoid peak system demands, they will be able to keep their bills comparatively small, and ideally see cost savings relative to gasoline and diesel– whether in the form of month-to-month expenditures, which is ideal, or over the lifetime cost of the vehicle after taking into account other savings and revenue opportunities available to customers.

b. How do electric rate designs used to incent business customers to adopt and use EV fleets affect the affordability of electric service for other electricity users?

If structured appropriately, increased EV load can create downward pressure on rates for all electricity users – if EV charging is managed in a way that allows more efficient use of the system overall, all ratepayers will derive benefit. Of course, the ICC must avoid a situation in which commercial EV rates act as a subsidy in a way that does not reflect the cost to serve over the long-term and may have the unfortunate result of leaving system costs more to customers least able to afford it. The Commission must find ways to encourage EV adoption in the near-term through mechanisms that mitigate potential market-chilling effects of rate structures that may have a penalizing effect during the early period of electrification, when low load factors may predominate, but while making sure that new fleet EV customers develop efficient approaches to managing their charging from the start and that rates over the longer term are reflective of grid conditions and cost to serve.

5. EV Charging Station Deployment by Businesses for Customer Use

a. Do current electric rate designs preven businesses from deploying charging equipment for customer use? If so, how?

b. Should electric rate designs be used to encourage businesses to deploy charging stations fro use by their customers? Why or why not?

c. If you are in favor of providing incentives through rate design, what specific electric rate designs can be used to motivate businesses to deploy charging stations for use by their customers?

d. How do electric rate designs used to ncent businesses to deploy charging stations for the use of their customers affect the affordability of electric service for other electricity users?

6. EV Charging Station Deployment by Units of Government

a. Do current electric rate designs prevent units of government from deploying charging equipment for public use? If so, how?

b. Should electric rate designs be used to encourage units of government to deploy charging equipment for public use? Why or why not?

c. If you are in favor of providing incentives through rate design, what specific electric rate designs can be used to motivate units of government to deploy charging equipment for public use?

d. How do electric rate designs used to incent units of government to deploy charging equipment for public use affect the affordability of electric service for other electricity users?

7. EV Adoption by Units of Government

a. Do current electric rate designs prevent units of government from adopting EV fleets (e.g., school buses, mass transit) for public use? If so, how?

Transit fleets, some of which may have little flexibility as to when they charge, may experience demand-based rates as challenging as commercial fleets do, or even more so.

Demand-based rates – especially non-coincident demand-based rates – can, for low load factor customers, result in charging costs that are unacceptably high compared to diesel, and some types of government fleet customers may have little opportunity to manage their demand in a manner that avoids these high charges. This does not necessarily mean that demand-based rates cannot be adapted for prospective fleet customers, but it does mean that to avoid allowing rates to slow electric vehicle adoption, the design of some demand-based rates (such as non-coincident demand-based rates) may need to be improved, and any chilling effect of demand-based rates on fleet owners who believe they will not be able to manage them needs to be taken into account. A discussion of options for adapting rates to meet the needs of new electrification customers can be found further below, at question A(13)(a).

b. Should electric rate designs be used to encourage units of government to deploy EV fleets (e.g., school buses, mass transit) for public use? Why or why not?

Yes. Ensuring that overall fleet economics of electric fleets can be favorable compared to diesel fleets is important, and the cost of charging is an important piece of fleet economics. Additionally, as with commercial fleets, government fleets may experience conventional rates as a disincentive to electrify especially during the early years, while their charging infrastructure is likely to be underutilized. As such, rate design should be structured in a way that can encourage that transition, while also ensuring that it incentivizes behavior that will be beneficial for the grid and the environment.

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate units of government to deploy EV fleets (e.g., school buses, mass transit) for public use?

See answer to Question A(4)(c).

d. How do electric rate designs used to incent units of government to deploy EV fleets (e.g., school buses, mass transit) for public use affect the affordability of electric service for other electricity users and the affordability of public transit?

See answer to Question A(4)(d).

8. Commercial Charging Station Providers

a. Are current electric rate designs a barrier to the deployment of public charging by commercial charging station providers? If so, how?

At least in the near-term, there is a possibility that rate design will be a barrier – though, as discussed below, higher utilization rates over time make demand charges less of a barrier. It is important to remember that fleets operating heavier vehicles are more likely – with the possible exception in the coming years of long-haul zero-emission vehicles – to use depot charging. Thus, public charging is more likely to be used for passenger vehicles, broadly speaking, in three main ways. First, public charging will be used by residents of multi-unit dwellings who will otherwise be unable to access charging, given the lack of motivation of landlords to provide charging stations for the residents. Second, public charging will be found along highway corridors as a stop-gap measure for cars to "top up" on longer journeys – and, less often, larger commercial vehicles that need fast charging en route. Third, fast charging will be used by drivers who stop at destination centers, utilizing their shopping or leisure time to charge their vehicles. There are two things to keep in mind. First, in the near-term, when utilization is still relatively low, and demand charges could create an unfavorable economic proposition, companies may be hesitant to site public charging stations; this is particularly true in disadvantaged communities where EV adoption is even lower. As such, integrating a way to mitigate the potentially negative impact of demand charges that seem unpredictable to customers (such as a demand charge holiday that is time-limited until utilization is higher, or relying on subscription charges) is imperative to ensuring that sufficient public charging is deployed in the near future to support anticipated numbers of EVs in future years. As well, public charging station providers should be transparent about their pricing – if favorable price signals are not passed through to the customer, increased utilization may be unlikely to occur in the near-term, further compounding what could otherwise be a solvable problem.

b. Should electric rate designs be used to encourage the deployment of public EV charging by commercial charging station providers? Why or why not?

As discussed above, rate design is likely to be a barrier in the near-term – especially where demand charges are inefficiently designed or where low load factors are likely to prevail during a temporary period of low utilization of charging infrastructure. As well, the Commission should consider whether it is appropriate to ensure a structure in which load at public charging stations is managed through passed-through price signals that ensure drivers themselves experience some or all of the cost of peak demand in order to avoid straining the grid.

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate the deployment of public EV charging by commercial charging station providers?

The Commission should consider a time-limited demand charge holiday or a subscription charge, as among alternatives necessary to mitigate the risk that low utilization combined with demand charges might make deployment of charging stations an unattractive economic proposition. Possible models include Southern California Edison's demand charge holiday, in which demand charges are suspended for 5 years and then slowly phased in; RMI's "sliding-scale tariff" described in a 2019 report, which is in effect a demand charge holiday for new public charging that is automatically phased out for any facility as utilization rates improve[7]; the subscription charge models proposed by Pacific Gas and Electric and San Diego Gas & Electric, in which customers (akin to a cell phone plan), choose their energy usage "plan".

d. How do electric rate designs used to incent the deployment of public EV charging by commercial charging station providers affect the affordability of electricity service for other electricity users?

[7] *See* https://rmi.org/insight/dcfc-rate-design-study/

If structured appropriately, increased EV load can create downward pressure on rates for all electricity users – if EV charging is managed in a way that allows more efficient use of the system overall, all ratepayers will derive benefit.

The effect of load flattening on the price of the commodity and distribution rates is important. But, low-income communities will benefit from well-designed strategies for electrifying a range of transportation and mobility modes, including:

- **E-Buses**: Public transit buses powered by electricity have many advantages over pollution spewing conventional diesel models, in addition to being quieter, smoother and exhaust-free. This includes
    - Estimated savings of $458,000 per bus in fuel and maintenance costs over their lifetime;
    - ~ $150,000 per bus in reduced annual healthcare costs due to avoided pollution; and
    - ~ Zero tail-pipe emissions instead of the average of about 117 metric tonnes per year for a typical diesel transit bus.
- **Shared Mobility**: Policymakers should explore clean, last-mile transportation options, including e-scooters, e-bicycles and EV car-sharing programs. Such low-cost e-mobility sharing services could begin as pilot programs in environmental justice communities.

    Shared vehicles can be centrally housed in optimal locations and charged overnight. In Chicago, shared EVs could be stationed in the "transit deserts" shown on the map on the next page (Figure F) developed by the Center for Neighborhood Technology. About 438,000 people—10% of the population of Cook County— live in these largely low-income neighborhoods that lack easy access to public transportation.
- **E-School Buses**: America's biggest transit system is its 485,000 school buses. Only a few hundred of them run on electricity, but e-buses are being tested in districts across the country. Illinois plans to invest up to 10% of its $109 million share of the Volkswagen diesel penalty fees in all-electric school buses. Their high initial costs—twice as much as an equivalent diesel bus, although that's anticipated to come down with higher manufacturing volumes— are offset over time by their fuel savings, particularly if charged at low overnight rates. Because school buses are often idle, batteries also could potentially help with grid support.
- **E-Trucks**: The U.S. has 9.3 million registered commercial trucks, including 2.9 million tractor trailers (also known as semi-trucks, or 18-wheelers), which produce 8% of the nation's total carbon emissions. While access to adequate charging infrastructure on the road is a big challenge, many trucks are local day carriers that can be centrally charged using low-cost overnight power after they return at the end of the day to their depots. E-truck and commercial fleet charging depots can be incentivized to locate where the existing grid has sufficient capacity for their high loads, so investment in new distribution infrastructure can be avoided. These locations are often in low-income areas where de-industrialization has occurred—

exactly the neighborhoods where there is a vital need for both non-polluting vehicles and new jobs.

- **Public E-Fleets**: Electrification of public fleet vehicles is a cost-effective clean energy strategy for government at all levels. Municipal EVs would save at least 55% on fuel costs in Chicago under managed charging. The city fleet of 10,000 light, medium and heavy-duty vehicles includes 3,000 police vehicles, 300 garbage trucks, and 300 snow plows. With predictable local routes and centrally managed charging, these fleets would be perfect candidates for electrification. Cooperative fleet procurement with other governmental units has the potential to reduce acquisition costs through volume-purchasing. This also provides a key opportunity to increase access to charging infrastructure for the general public – such as giving public access to fast chargers at municipal transportation hubs that are located in low-income neighborhoods where city fleets and buses also charge.

9. Low to Moderate Income Customer EV Adoption and Use

a. Do current electric rate designs present a barrier to the adoption or use of EV technology by low to moderate income citizens? If so, how?

They can, if rates are not structured to provide for savings, on average, relative to gasoline. However, the bigger barrier in these communities is likely to be the upfront cost of the vehicle, and lack of access to secondary market vehicles – as well as (given the higher likelihood that low- to moderate-income citizens are likely to live in multi-unit dwellings) access to sufficient infrastructure. The ICC and other state agencies should work to ensure enhanced access to vehicles and infrastructure, particularly among low-income communities, and communities that are disproportionately burdened by harmful air pollution.

State and federal tax credits are crucial to new EV purchases. But the growing number of used EVs presents an opportunity to bring them to drivers who cannot purchase a new one. Early models of cars such as the Nissan Leaf can travel 75-80 miles on a charge, making them well-suited for daily driving around town and average commuting. Initial fears that EV batteries would degrade have proven unfounded, and electric motors last far longer than traditional engines, making EVs a good used-car option. Some pre-owned EVs are available at low prices compared to similar IC vehicles, and their low operating costs make them a favorable cost proposition —provided that convenient charging opportunities are available.

EVs are almost non-existent in low-income neighborhoods. Many households cannot afford any kind of car, or residents prefer to walk, bike or take public transportation. Those who own a car often do not have access to a parking spot to plug it in. And, although over time the operating savings can make the cost of an EV lower than a traditional car, the initial outlay for a new EV remains beyond the reach of consumers with limited incomes. Low-income buyers also face barriers to financing, and vital EV information can be difficult to find for those whose native language is not English. However, combined with consumer education, creative programs like these may be able to bring personal EVs to under-resourced communities:

- Income-based rebates for used EVs and home chargers;

- Income-based swap programs to facilitate trading-in IC vehicles for EVs or other clean energy mobility solutions;
- Geo-targeted public charge station development (with discounts for local residents).

Public policy drivers may require modifications to the traditional agnosticism of designing rates based on pure cost causation. While there may initially be some subsidization of these types of programs, over time such programs will positively contribute to system optimization and provide benefits that exceed the costs.

b. Should electric rate designs be used to encourage the use of EV technology by low to moderate income citizens? Why or why not?

Yes – just as it should be used to encourage adoption in other contexts. Time-variant rates that allow customers to save money by engaging in positive charging behavior (i.e. that provides grid and environmental benefits) will help customers save money, particularly if layered on top of discounts for low-income customers. This should also be paired with effective energy efficiency measures that provide the appliances and enabling technologies that can better ensure that low- and moderate-income customers are able to adequately take advantage of time-variant rates.

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate the use of EV technology by low to moderate income citizens?

Time-differentiated rates that provide an incentive for proper charging behavior through price signals to charge at times where there is less demand and/or greater availability of renewable energy have been shown to make charging cars competitive with fueling them with gasoline in other jurisdictions. It may be especially difficult to convey such price signals to LMI citizens who reside in multifamily housing, but it is important that LMI citizens, who may struggle beneath a heavier energy burden than other citizens, have fair access to this low-cost alternative to gasoline.

d. How do electric rate designs used to incent use of EV technology by low to moderate income citizens affect the affordability of electric service for other electricity users?

If structured appropriately, increased EV load can create downward pressure on rates for all electricity users – if EV charging is managed in a way that allows more efficient use of the system overall, all ratepayers will derive benefit.

e. Are there other ways to provide benefits from EVs to low to moderate income citizens?

Distribution of EVs and infrastructure should be equitable. While replacing an increasing number of IC engine vehicles with EVs will provide benefits in the form of improved air quality, which will be good for all, it cannot be ignored that today, some communities suffer more than others from poor air quality as a result of vehicular emissions – and the very communities in which low- and moderate income customers reside are often also environmental justice communities, which experience a disproportionate impact from emissions from medium- and heavy-duty vehicles. As such, measures to ensure that disadvantaged communities see more than their share of EV deployment sooner rather than later inures to the benefit of may low to moderate income citizens. Enhanced rebates and incentives for vehicles, infrastructure development, and charging stations in these communities is therefore imperative in order to ensure equitable transportation policies. Similarly, enabling technologies (like apps that can ease the complexity of time-variant rates for customers) as well as paired solutions (e.g. on-site distributed renewable generation that is financed by the government or the utility) can result in further benefits.

10. Environmental Impacts of EV Use

a. Do current electric rate designs prevent customers from using EVs in a manner that has a positive environmental impact? If so, how?

While in much of the country, the price of electricity does not vary based on the time of day, Illinois is unique in that it has real time rate programs available to retail customers of all sizes[8]. The absence of similar programs in other jurisdictions is unfortunate because shifting consumption away from peak times can also reduce the use of higher-cost, high emission peaking generation.

In locations where renewable energy makes up a substantial part of the energy mix, and is also less expensive than fossil-fuel derived energy, it also constitutes a missed opportunity to align market forces with emissions efficiency by providing a price signal to encourage charging at times when renewables are dominant. Using EVs – which are storage devices on wheels – in a way that integrates more renewable energy, often feared to be unreliable compared to more "firm" resources like natural gas and coal, can effectively ensure that a state can transition more of its energy supply to clean resources.

b. Should electric rate designs be used to encourage customers to use EVs in a manner that has a positive impact on the environment? Why or why not?

Yes. Generally speaking, price signals should incentivize customers to charge at times when the energy mix on the grid is cleaner. That is, when solar or wind is the predominant available energy source, prices should be demonstrably cheaper in order to influence energy usage towards those times. This will have the dual benefit of being less reliant on polluting fossil fuel plants, while also being able to integrate sources of energy that may be more intermittent; avoiding curtailment improves the value of renewable generation and can have the further benefit of reducing overall system costs.

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate customers to use EVs in a manner that has a positive impact on the environment?

[8] *See, e.g.,* https://citizensutilityboard.org/wp-content/uploads/2017/11/20171114_FinalRealTimePricingWhitepaper.pdf

Behavioral incentives can be facilitated by good rate design paired with effective marketing, education, and outreach. As discussed in the previous answer, there should be a differential between times when, generally, there is more likely to be lower demand and more clean energy available, and times when the system is likely to be more strained and clean energy less available.

d. How do electric rate designs used to incent customers to use EVs in a manner that has a positive impact on the environment affect the affordability of electric service for other electricity users?

See response to question A(4)(d).

11. EV Use Impacts on Grid Costs

a. Do current rate designs incent customers to use EVs in a manner that reduces grid costs (e.g., distribution costs, transmission costs, capacity costs)?

We believe hourly pricing does incent EVs to reduce grid costs, and a well-designed TOU rate could accomplish the same end. We need to make sure that EVs charge when it is best for the grid. Time-based rates are effective at motivating EV owners to charge their vehicles when they will not burden the utility system. And, as shown in *Charge for Less*, they also provide a route for EV drivers to unlock savings at the same time. For these reasons, we recommend that policymakers strongly consider opt-out time variant pricing for EV charging. One rate structure is usually applied to all usage in a home, but it need not be in the case of EVs, as the chargers (and/or cars) have sophisticated sensor and data-analysis capabilities. Although we generally believe that the risks of dynamic pricing—and the concomitant benefits of average rates—are overstated, separately calculating EV charging costs can be a boon to adoption by customers who may fear having all their household usage priced under a time-variant rate. The need to get out ahead of transportation electrification to maximize consumer and environmental value is strong, and we do not want to see opt-out dynamic rates for EV charging stalled because of controversies surrounding opt-out whole-home dynamic pricing.

In other parts of the country, careful rate design has shown potential to reduce grid impacts by incentivizing energy usage at times of lower demand and increased availability of renewable energy. Illinois' use of dynamic rates has been demonstrated to reduce costs for customers across the board and will potentially result in more effective use of the grid.

b. Should electric rate designs be used to incent customers to use EVs in a manner that reduces grid costs? Why or why not?

Yes. Rate design that discourages increased demand at times when the grid is already constrained should be a goal. If load is managed to the extent possible through well designed and effective rates, utilities may be able to prevent the build-out of costly, and possibly avoidable, grid infrastructure. Importantly, better utilizing infrastructure despite increased load can serve to drive down rates for all customers.

c. **If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to encourage customers to use EVs in a manner that reduces grid costs?**

Several attributes are essential for any rate design to encourage customers to use EVs in a manner that reduces grid costs:

- Timing_matters. As discussed above, the time when electricity is consumed always matters. The cost of the commodity literally varies around the clock, and future system costs are shaped by today's demand. Any price structure capable of encouraging efficient grid use will need to be at a minimum time-variant – whether what is being priced is demand or consumption.
- In the case of the energy commodity, pricing should at a minimum push consumption away from known peak times, but ideally, more granular is even better; dynamic price signals that better reflect grid conditions and encourage the uptake of renewable power not only benefit the customers who pay in accordance with them, but can lower costs for other customers in the present and future by avoiding wasteful curtailment and enhancing the value of renewable generation.
- In the case of demand, timing also matters. For some customers, provided their own individual peak demand is not large enough to have significant impact outside the local area of the grid, time-variant volumetric charges may provide a sufficiently efficient price signal; however, where individual peak demand is large enough to matter, the challenge is to provide a price signal that encourages vehicle owners to manage their demand while leaving room for strategic charging. Non-coincident demand is rarely of great consequence except very locally; most charges based on demand should be based on coincident peak demand. Overreliance on pricing based on non-coincident demand can even prove counterproductive if it discourages high consumption of intermittent renewables when they are available.

12. EV Use Impacts on Reliability and Resiliency

a. **Do current electric rate designs prevent customers from using EVs in a manner that has a positive reliability and resiliency impact on the grid? If so, how?**

Rate design can do more to encourage appropriate charging behavior. As well, the Commission should work on changing rules so that vehicles can bid into the MISO market – currently, while MISO allows DERs like electric vehicles to bid into the market, Illinois prevents them from doing so. Establishing this capability while also encouraging clear market signals that facilitate the use of more advanced capabilities, like bidirectional charging and ancillary services, will be imperative to maximizing the potential of electric vehicles. Customers will be hesitant to embrace the provision of these technologies if there does not seem be an adequate compensation or certainty in the market. As well, time-variant feed-in tariffs might be a valuable option for consideration; that is, rewarding customers for providing energy to the grid at times of high peak demand in order to avoid grid constraint and reduce the need to build out expensive infrastructure that may increase prices for all customers.

b. Should electric rate designs be used to encourage customers to use EVs in a manner that has a positive reliability and resiliency impact on the grid? Why or why not?

Yes. Facilitating the use of EVs to provide reliability and resiliency, even as more renewable energy is put on the grid, will be an important means of ensuring that an increasing population of these vehicles is a benefit rather than a curse. Further, to the extent possible, EVs should be charging with lower-emission baseload generation, and avoiding the use of dirty peaker plants designed to respond quickly – enabling vehicles to discharge at those peak times and reduce the emissions from generation overall.

As well, the Commission should explore the implications of coupling EV charging infrastructure with other distributed generation and distributed energy resources, including implications for rate design. Having on-site solar generation that can be used to charge vehicles – and having enhanced storage capability to capture excess solar energy – will result in a vertically integrated system that can further help to maximize the environmental and grid benefits of increasing numbers of electric vehicles.

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate customers to use EVs in a manner that has a positive reliability and resiliency impact on the grid?

Time variant rates should be used to optimize residential EV charging. A successful TOU rate structure must have price variance large enough to incent drivers to charge their EV during the low-price periods and to avoid charging during high-price periods. To be effective at shaping charging patterns, the rate must be easily understood by customers and designed to achieve intended outcomes. Higher price differentials would have greater impact, but regulators should consider how to recover the costs of service fairly and reflect market acquisition costs, while achieving intended outcomes. Different pricing models, such as using simple ratios of peak to off-peak prices, should be tested and evaluated. Additionally, a utility TOU rate plan that applies only to the EV charging portion of a customer's bill may increase participation in time-variant rates. Ameren recently proposed this type of rate, which is being examined in Docket No. 20-0710.

In order to be effective, an EV-specific rate should have the following attributes:

• **No extra meter required**.

Smart meters in Illinois already provide accurate interval usage data for customer billing. The EV portion of that household usage can be determined through the vehicle charger, or through a module that communicates with the smart meter, or by analyzing usage with disaggregation software. These methods should be studied for relative cost and accuracy, but in any case there is no need to incur the expense of a separate utility meter. Because the existing utility meter accurately captures billing-quality data for all usage, any small discrepancies in allocating between EV and other household usage are inconsequential.

• **Significant and comprehensible price differentials**. As with any time-variant rate design, the customer savings from charging in low-priced periods must be substantial enough to motivate efficient charging behaviors. A revised Xcel pilot program now utilizes a Level 2 (240 volt) smart charger rather than a separate meter and charges a fixed monthly fee.[9]

• **Automatic enrollment**. Customers purchasing an EV should be enrolled in EV-only rates, with an opt-out choice for those who want another plan. At a minimum, any state incentives promoting EV adoption should be tied to participation in some type of dynamic pricing. While the savings from off-peak charging would make TOU rates a "no-brainer" for knowledgeable consumers, inertia, as well as a lack of awareness about time-variant rates, and mistrust of the utility could leave many EV owners charging on more expensive flat rates— and during peak periods.

Additionally, enabling customers of all types to optimize their EV charging loads requires technical solutions to provide them real-time information on system conditions and market prices, and the ability to schedule, pause, and resume charging remotely and automatically in response to customer-specified variables. As part of their responsibility for the reliable and efficient operation of the grid, utility companies should be given the new responsibility to make these tools available and integrate them into grid operations.

d. How do electric rate designs used to incent customers to use EVs in a manner that has a positive reliability and resiliency impact on the grid affect the affordability of electric service for other electricity users?

Well-managed, or optimized, EV charging can put downward pressure on the statewide costs of energy, capacity, and delivery of electricity. EVs have flexible charging needs, which open up opportunities to save money and make the electric system more efficient. "Optimized Charging" means consistently charging an EV in a manner that reduces the EV owner's electricity costs while also improving the system load shape, enhancing reliability of the grid, and maximizing utilization of clean energy. If vehicles, on the whole, are used in a manner that has a positive reliability and resiliency impact on the grid, this will only serve to reduce system costs. By reducing the need for infrastructure build-out and reducing risk to the grid overall, EVs can ultimately save ratepayers money.

CUB examined the effect of using real time pricing rates on individual electricity usage: Adding up the incremental costs of EV home charging, a ComEd customer using 3,066 kWh to

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[99] See: https://
www.xcelenergy.com/energy_portfolio/innovation/electric_vehicles/ev_service_pilot_pre_enrollment. 52 Ian Schneider & Cass R. Sunstein, Behavioral Considerations for Effective Time-Varying Electric Prices, 1 Behavioral Pub. Pol'y 219, 228–30 (2017), https://www.cambridge.org/core/services/aop-cambridge-core/content/view/79540B0B70604EFF676BE86B89F96800/S2398063X17000021a.pdf/

drive an EV 10,950 miles would pay approximate annual costs of $200 if charging under hourly pricing at night compared with $337 under flat rates (plus taxes), a savings of 41%. Similarly, an Ameren Illinois customer would pay $200 for overnight charging under that utility's real-time pricing program, compared with $276 under prevailing flat rates (plus taxes), a savings of 27%. In either case electricity would cost far less than gasoline, which would amount to $1,095 for the same driving distance, assuming a 30 mile per gallon (mpg) vehicle using $3 per gallon gasoline.

The results of Ameren and ComEd real time pricing programs for 2019 demonstrate how real time rates produce customer savings in addition to positive reliability and resiliency impacts. The latest data shows:

- ComEd's Hourly Pricing participants saved an average of 14.0% on supply charges compared to ComEd's standard fixed-price rate.
    - There were 39,196 distinct accounts that billed on Hourly Pricing during 2019. When considering total bill savings, 26,959 accounts (68.8%) saved money and seven accounts broke even on Hourly Pricing. Annual participant savings ranged from $0.01 (0.001%) to $9,139.08 (29.3%). The median annual participant savings was $69.99 (9.8%). The minimum percentage saved was 0.001% ($0.01), and the maximum percentage saved was 38.5% ($178.27).
- Ameren's Power Smart Pricing program had 12,970 active participants and 81% of participants enjoyed annual savings as compared to what they would have paid under the fixed supply rate.
    - The average dollar savings per participant in 2019 was $49.03. The aggregate savings for Power Smart Pricing participants was $723,544, which represented a 3.8% total bill savings and 8.4% electricity supply savings compared to what the same bills would have been under the standard residential rate.
    - For comparison, the average supply cost per kWh that Power Smart Pricing participants paid as a result of load shifting in 2019 was 4.18 cents/kWh, compared with an average BGS supply cost of 4.56 cents/kWh.

13. EV Rate Design Principles

a. Are there examples of rate design principles or rate designs, not addressed above, that would result in EV adoption or use in a manner that would be in the public interest? If so, please explain.

Although some high-level rate design principles for EV adoption are equally applicable to a range of vehicles and use cases, it is important to remember that different kinds of vehicles will have vastly different charging needs. As such they need separate attention to determine what infrastructure is necessary to support them, what charging speeds are needed, and how rates need to be adapted in the near-term to mitigate the risk of untenable bills.

Over any foreseeable time horizon, key goals of rate design for EVs need to include facilitating – or at least not getting in the way of – a wide-scale transition to electrification of vehicles, and providing EV customers an incentive to use the electric system efficiently by charging at times when the system is the least constrained (and preferably when clean or zero-carbon electric generation is most available) and in a manner that does not unduly burden the grid. In an ideal future state, the price signals that shape vehicle charging behavior will not merely minimize the burden they pose, but will enable them to provide valuable grid services, such as balancing (i.e. dispatching energy to the grid at times of high demand, or vehicle-to-grid) and capacity, on an ongoing basis.

For fleet customers, it is essential to recognize that one size does not fit all. No one rate design will be appropriate or workable for all fleet customers – yet, to meet emissions reduction goals, most fleets of all types will need to transition away from diesel as soon as possible. Therefore, utilities need to offer a range of rate options that is sufficiently robust that fleet customers with highly diverse characteristics – different vehicle types, different duty cycles, different levels of experience with complex electric rates, different facility types with other on-site load – will be able to choose an option that they find workable so that the transition away from tailpipe emissions is not hindered by rate designs that are perceived as untenable.

Although we cautioned above that demand-based rates can have negative consequences for some fleet customers, especially in the short term, basing bills partly on demand can play an important role in containing system costs over the long term. With vehicle charging likely to be a major user of the electric system in the future, containing those costs will be critical. However, in the short-term, encouraging adoption in a way that helps to build economies of scale and reduces the upfront cost of vehicles and infrastructure, it is paramount that prospective customers anticipate that their bills for charging their vehicles will be manageable (and ideally, lower than the price to fuel their vehicles).

Demand-based rates can be made simultaneously more manageable and also more cost-reflective and more efficient by relying primarily on coincident peak demand rather than non-coincident; this is a win-win for customers and the system. To the extent that the uncertainty about the particular day or days on which system peak demand occurs is too burdensome for many fleet customers, rate designs that include a pre-specified peak period for evaluating demand ("Time of Use" style, but for demand) is a more manageable approach than rate designs that vary depending on when the system peak actually winds up occurring, as determined after the fact. In addition, demand-based rates can be made more manageable and less seemingly punitive by moderating how demand is assessed to avoid the perception that EV fleet owners will be punished for infrequent mistakes: for example, demand can be assessed over longer periods, or re-assessed more frequently.

Alternatively, for fleet customers that are not ready for demand-based rates in any form – whether due to low utilization of equipment as they begin their transition, a duty cycle that inevitably condemns them to high demand at peak periods, or for other reasons – time-of-use volumetric pricing may achieve much of the same benefit, especially while charging loads are comparatively small; among numerous diverse customers, each with a time-based signal to charge during a comparatively low-cost period but none with an incentive to minimize their demand, the diversity in business practices may suffice to spread out their aggregate demand. Although this is a far less satisfactory approach as individual loads grow to significant size, this means that time-of-use volumetric rates may provide a simplified entry-level approach to inviting electrification while encouraging efficient charging for prospective fleets.

With respect to the energy component of the bill, the availability in Illinois of a truly dynamic supply tariff may prove a potent tool for signaling fleet owners to optimize their charging behavior. Moreover, to the extent that future wholesale prices reflect a price on carbon, a tariff that passes through wholesale prices to retail customers can be expected to act as an effective tool for favorably selecting the least-emitting power and avoiding the most-polluting, enhancing the competitiveness of non-emitting power generation.

b. Are there examples of other mechanisms that may be used in conjunction with rate designs (e.g., pairing load management with rate design) that would result in EV adoption or use in a manner that would be in the public interest? If so, please explain.

Rate design will be more effective and manageable when paired with load management. Pairing EV charging with distributed solar as well as on-site storage can improve the economic and environmental results of transportation electrification.

Additionally, enabling customers to optimize their EV charging loads requires technical solutions to provide them real-time information on system conditions and market prices, and the ability to schedule, pause, and resume charging remotely and automatically in response to customer-specified variables. As part of their responsibility for the reliable and efficient operation of the grid, utility companies should be given the new responsibility to make these tools available and integrate them into grid operations

c. Please provide examples of rate designs employed in other states or jurisdictions that might serve as best practices to EV adoption or use in Illinois.

California's millions of distributed solar photovoltaic panels produce peak supply during the sunniest time of day and cease output at night. On occasion, 50% of the afternoon demand has been met with solar power, meaning less demand at those times for grid-sourced energy from large power plants (and therefore lower wholesale energy market prices). These independent supply and demand cycles interact to form what is referred to as the California "duck curve," in which market prices tend to dip midday and spike in the evening, a pattern that can make daytime workplace EV charging a cost-effective strategy for using the existing assets on the grid. Similarly, states with significant wind power at night can incentivize overnight charging to leverage this lower-cost, night-peaking resource.

B. <u>Rate Design Impacts on Other Forms of Beneficial Electrification</u>

1. **What types of beneficial electrification other than adoption of EVs should the Commission be examining?**
2. **Adoption and Use**
   a. **Do current electric rate designs present a barrier to the adoption or use each such other form of beneficial electrification? If so, how?**
   b. **Should electric rate designs be used to encourage the use of each such other form of beneficial electrification? Why or why not?**

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate the use of each such other form of beneficial electrification?

d. How do electric rate designs used to incent each other form of beneficial electrification affect the affordability of electric service for other electricity users?

e. Are there other ways to provide benefits from each such other form of beneficial electrification?

3. Environmental Impacts of Beneficial Electrification Use

a. Do current electric rate designs prevent customers from using each such other form of beneficial electrification in a manner that has a positive environmental impact? If so, how?

b. Should electric rate designs be used to encourage customers to use each such other form of beneficial electrification in a manner that has a positive impact on the environment? Why or why not?

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate customers to use each such other form of beneficial electrification in a manner that has a positive impact on the environment?

d. How do electric rate designs used to incent customers to use each such other form of beneficial electrification in a manner that has a positive impact on the environment affect the affordability of electric service for other electricity users?

4. Beneficial Electrification Use Impacts on Grid Costs

a. Do current rate designs incent customers to use each such other form of beneficial electrification in a manner that reduces grid costs (e.g., distribution costs, transmission costs, capacity costs)?

b. Should electric rate designs be used to incent customers to use each such other form of beneficial electrification in a manner that reduces grid costs? Why or why not?

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to encourage customers to use each such other form of beneficial electrification in a manner that reduces grid costs?

d. How do electric rate designs used to incent customers to use each such other form of beneficial electrification in a manner that reduces grid costs affect the affordability of electric service for other electricity users?

5. Beneficial Electrification Use Impacts on Reliability and Resiliency

a. Do current electric rate designs prevent customers from using each such other form of beneficial electrification in a manner that has a positive reliability and resiliency impact on the grid? If so, how?

b. Should electric rate designs be used to encourage customers to use each such other form of beneficial electrification in a manner that has a positive reliability and resiliency impact on the grid? Why or why not?

c. If you are in favor of providing incentives through electric rate design, what specific electric rate designs can be used to motivate customers to use each

such other form of beneficial electrification in a manner that has a positive reliability and resiliency impact on the grid?

d. **How do electric rate designs used to incent customers to use each such other form of beneficial electrification in a manner that has a positive reliability and resiliency impact on the grid affect the affordability of electric service for other electricity users?**

6. **Beneficial Electrification Rate Design Principles**
   a. **Are there examples of rate design principles or rate designs, not addressed above, that would result in each other such form of beneficial electrification adoption or use in a manner that would be in the public interest? If so, please explain.**
   b. **Are there examples of rate design principles or rate designs, not addressed above, that would result in each other such form of beneficial electrification adoption or use in a manner that would be in the public interest? If so, please explain.**
   c. **Please provide examples of rate designs employed in other states or jurisdictions that might serve as best practices with respect to each such other form of beneficial electrification adoption or use in Illinois.**

C. <u>Rate Design Implementation</u>

1. **Please identify any rate design changes that you would recommend be adopted in Illinois, including the rate design changes addressed above.**
2. **For any rate design you recommend be adopted, please explain the process required to adopt such rate design (e.g., requires a change in law, requires a change in Commission rules, requires a tariff change, etc.)**
3. **Please identify how your recommended rate design changes may affect low or moderate income citizens.**

Respectfully submitted,

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